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10/625,321	07/23/2003	Peter Michael Edic	120521-2/YOD GERD:0052	7756
7590 12/28/2004			EXAMINER HO, ALLEN C	
Patrick S. Yoder FLETCHER YODER P.O. Box 692289 Houston, TX 77269-2289			ART UNIT 2882	
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DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/625,321

Applicant(s)

EDIC ET AL.

Examiner

Allen C. Ho

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 7, 9-12, 14, 15 and 17-26 is/are rejected.
- 7) ☒ Claim(s) 5, 8, 13 and 16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 072003, 112004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION***Drawings***

1. Fig. 3 is objected to because reference number 82 does not cover two arc lengths as described in the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claim 23 is objected to because of the following informalities: --system-- should be inserted after "computer". Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 1, 17, and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Hsieh *et al.* (U. S. Patent No. 6,754,300 B2).

With regard to claim 1, Hsieh *et al.* disclosed a method for acquiring a projection data set, comprising: rotating (30) a gantry comprising a distributed x-ray source (14) slowly about a volume of interest, wherein the path of the gantry comprises a plurality of arcs (a circular path is divided into a plurality of arcs, each arc is subtended by the dimension of the x-ray source); emitting x-rays (16) from a portion of the distributed x-ray source overlying an active arc (when an arc becomes an active arc; a definition); designating (moving the distributed x-ray source to the next arc) a next sequential arc in the direction of rotation the active arc when a trailing edge of the distributed x-ray source coincides with the boundary between the active arc and a preceding arc until each arc has been the active arc at least once (this step simply follows the definition of an active arc given in the last step); and acquiring (32) a projection data set comprising a plurality of projections generated from the emitted x-rays.

With regard to claim 17, Hsieh *et al.* disclosed a CT image analysis system, comprising: a gantry (12) comprising a distributed x-ray source (14) configured to slowly rotate about a volume of interest, wherein the path of the gantry comprises a plurality of arcs (a circular path can always be divided into a plurality of arcs; this is a definition, not a structural limitation), wherein the distributed x-ray source is configured to emit a stream of radiation (16) from the portion of the distributed x-ray source overlying an active arc (definition of an active arc); a detector (18) configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements (20); a system controller (36) configured to control the x-ray source and to acquire a set of projection data during one or more slow rotations of the distributed x-ray source about a dynamic object from one or more of the detector elements via a data acquisition system (32); and a computer system (36) configured to receive the set of projection data and to designate (moving the distributed x-ray source to the next arc) a next sequential arc in the direction of rotation the active arc when a trailing edge of the distributed x-ray source coincides with the boundary between the active arc and a preceding arc until the distributed x-ray source has completed at least one rotation of the gantry.

With regard to claim 24, this claim fails to set forth additional structural limitation. Accordingly, claim 24 is rejected with claim 17.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the

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inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

5. Claims 17 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Hell *et al.* (U. S. Patent No. 5,633,906).

With regard to claim 17, Hell *et al.* disclosed a CT image analysis system, comprising: a gantry comprising a distributed x-ray source (1) configured to slowly rotate about a volume of interest, wherein the path of the gantry comprises a plurality of arcs (11, 12, 13, ...), wherein the distributed x-ray source is configured to emit a stream of radiation (5) from the portion of the distributed x-ray source overlying an active arc (the arc that is irradiated by an electron beam 2); a detector (7) configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements; a system controller configured to control the x-ray source and to acquire a set of projection data during one or more slow rotations of the distributed x-ray source about a dynamic object from one or more of the detector elements via a data acquisition system (column 2, lines 26-32); and a computer system configured to receive the set of projection data and to designate (irradiating an arc with an electron beam 2) a next sequential arc in the direction of rotation the active arc when a trailing edge of the distributed x-ray source coincides with the boundary between the active arc and a preceding arc until the distributed x-ray source has completed at least one rotation of the gantry.

With regard to claim 24, this claim fails to set forth additional structural limitation. Accordingly, claim 24 is rejected with claim 17.

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6. Claims 1-4, 17-21, and 24-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Yavuz *et al.* (U. S. Patent No. 6,522,712 B1).

With regard to claim 1, Yavuz *et al.* disclosed a method for acquiring a projection data set, comprising: rotating a gantry (112) comprising a distributed (*i. e.*, to spread x-rays) x-ray source (114, 214, 314) slowly about a volume of interest, wherein the path of the gantry comprises a plurality of arcs (a circular path is divided into a plurality of arcs, each arc is subtended by the dimension of the x-ray source); emitting x-rays (104) from a portion of the distributed x-ray source overlying an active arc (when an arc becomes an active arc; a definition); designating (moving the distributed x-ray source to the next arc) a next sequential arc in the direction of rotation the active arc when a trailing edge of the distributed x-ray source coincides with the boundary between the active arc and a preceding arc until each arc has been the active arc at least once (this step simply follows the definition of an active arc given in the last step); and acquiring (124) a projection data set comprising a plurality of projections generated from the emitted x-rays.

With regard to claim 2, Yavuz *et al.* disclosed the method as recited in claim 1, further comprising: generating a set of interpolated projections (1040) by interpolating the projection data set using a set of concurrently acquired phase data (1120) and frequency content (1110) of the projection data set, wherein each interpolated projection characterizes the projection data set at a view location of the gantry and at a particular time; and reconstructing the set of interpolated projection to generate one or more images.

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With regard to claim 3, Yavuz *et al.* disclosed the method as recited in claim 2, further comprising: associating two or more images to generate a volume rendering (column 23, lines 36-39).

With regard to claim 4, Yavuz *et al.* disclosed the method as recited in claim 2, wherein the volume of interest comprises a heart having a cardiac period (cardiac imaging).

With regard to claim 17, Yavuz *et al.* disclosed a CT image analysis system, comprising: a gantry (112) comprising a distributed x-ray source (114, 214, 314) configured to slowly rotate about a volume of interest, wherein the path of the gantry comprises a plurality of arcs (a circular path is divided into a plurality of arcs; this is a definition, not a structural limitation), wherein the distributed x-ray source is configured to emit a stream of radiation (104) from the portion of the distributed x-ray source overlying an active arc (definition of an active arc); a detector (116) configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements (118); a system controller (140) configured to control the x-ray source and to acquire a set of projection data during one or more slow rotations of the distributed x-ray source about a dynamic object from one or more of the detector elements via a data acquisition system (124); and a computer system (140) configured to receive the set of projection data and to designate (moving the distributed x-ray source to the next arc) a next sequential arc in the direction of rotation the active arc when a trailing edge of the distributed x-ray source coincides with the boundary between the active arc and a preceding arc until the distributed x-ray source has completed at least one rotation of the gantry.

With regard to claim 18, Yavuz *et al.* disclosed the CT image analysis system as recited in claim 17, wherein the computer system is further configured to generate a set of interpolated projections (1040) by interpolating the set of projection data using a set of concurrently acquired phase data (1120) and the frequency content (1110) of the set of projection data, wherein each interpolated projection characterizes the projection data set at a view location of the gantry and at a particular time and to reconstruct the set of interpolated projections to generate one or more images.

With regard to claim 19, Yavuz *et al.* disclosed the CT image analysis system as recited in claim 18, wherein the computer system is further configured to associate two or more images to generate a volume rendering (column 23, lines 36-39).

With regard to claims 20 and 21, these claims fail to set forth additional structural limitation. Accordingly, claims 20 and 21 are rejected with claim 18.

With regard to claim 24, this claim fails to set forth additional structural limitation. Accordingly, claim 24 is rejected with claim 17.

With regard to claim 25, Yavuz *et al.* disclosed a CT image analysis system, comprising: means (100) for generating a projection data set comprising projections acquired at different instants in time with respect to a cardiac cycle at each view position of a CT gantry; and means (130, 140) for generating a set of interpolated projections (1040) using the projection data set.

With regard to claim 26, Yavuz *et al.* disclosed the CT image analysis system as recited in claim 25, further comprising: means (130, 140) reconstructing the set of interpolated projections to generate one or more images; and means (130, 140) for associating two or more images to generate a volume rendering.

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The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yavuz *et al.* (U. S. Patent No. 6,522,712 B1) as applied to claim 2 above, and further in view of Pan *et al.* (U. S. Patent No. 6,272,200 B1).

With regard to claim 6, Yavuz *et al.* disclosed the method of claim 2. However, Yavuz *et al.* failed to teach that the step of interpolating the projection data set comprises reducing statistical noise in the projection data.

Pan *et al.* taught that statistical noise in the reconstructed volume could be reduced by using a suitable interpolation method (column 3, line 53 - column 4, line 6).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a suitable interpolation method that comprises reducing statistical

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noise in the projection data, since a person would be motivated to obtain a reconstructed image without noise or artifact.

With regard to claim 7, Yavuz *et al.* in combination with Pan *et al.* disclosed the method as recited in claim 6, further comprising reducing an x-ray dose applied to the volume of interest in response to the reduction in statistical noise (column 4, lines 7-17).

9. Claims 9-12, 14, and 15 are rejected under 35 U.S.C. 103(a) as being obvious over Yavuz *et al.* (U. S. Patent No. 6,522,712 B1) in view of Pan *et al.* (U. S. Patent No. 6,272,200 B1).

With regard to claims 9-12, 14, and 15, although Yavuz *et al.* in combination with Pan *et al.* disclosed the method as recited in claims 1-4, 6, and 7, Yavuz *et al.* failed to teach that the method is a computer program stored on one or more computer media.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the method as recited in claims 1-4 as a computer program stored on one or more computer media, since a person would be motivated to use a computer program to control and run a computer-based system.

10. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yavuz *et al.* (U. S. Patent No. 6,522,712 B1) as applied to claim 18 above, and further in view of Pan *et al.* (U. S. Patent No. 6,272,200 B1).

With regard to claims 22, Yavuz *et al.* disclosed the CT image analysis system as recited in claim 18. However, Yavuz *et al.* failed to teach that the computer system, when generating a set of interpolated projections, reduces statistical noise in the set of projection data.

Pan *et al.* taught that statistical noise in the reconstructed volume could be reduced by using a suitable interpolation method (column 3, line 53 - column 4, line 6).

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It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a suitable interpolation method that comprises reducing statistical noise in the projection data, since a person would be motivated to obtain a reconstructed image without noise or artifact.

With regard to claim 23, Yavuz *et al.* in combination with Pan *et al.* disclosed the CT image analysis system as recited in claim 22, wherein the computer system is further configured to reduce an x-ray dose applied to the volume of interest in response to the reduction in statistical noise (column 4, lines 7-17).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or

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subject to an obligation of assignment to the same person. See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Allowable Subject Matter

11. Claims 5, 8, 13, and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- (1) Mihara *et al.* (U. S. Patent No. 6,807,248 B2) disclosed a CT system comprising a distributed x-ray source.
- (2) Hsieh (U. S. Patent No. 6,529,574 B1) disclosed a method and an apparatus for FOV-dependent aliasing artifact reduction.
- (3) Li (U. S. Patent No. 6,459,755 B1) disclosed a method and an apparatus for administering low dose CT scans.
- (4) Yamamura *et al.* (U. S. Patent No. 4,274,005) disclosed a CT system comprising a distributed x-ray source.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Allen C. Ho
Patent Examiner
Art Unit 2882

17 December 2004